imitation. We have submitted Mr. Du Chaillu's volume to several friends of diverse ages and sexes in the hope of obtaining an opinion as to the class of readers for whose benefit it is specially intended, but in no instance have we succeeded in obtaining a definite answer on this point. One thing is perfectly certain, namely, that no scientific naturalist will gain any information worth having from a perusal of its pages. A lady suggested hat it was like a book for very young children, without being sufficiently amusing.

The author, who firmly believes that animals have a definite language by means of which they communicate their ideas, not only to their own fellows, but to the members of other species as well, had a grand subject before him in describing the life of the denizens of the great Congo forest. But, in our opinion, the conversation he has put into the mouths of the animals is the merest drivel. And when animals, such as leopards antelopes and elephants, have familiar English names, we quite fail to see the advantage of alluding to them, by their negro titles, apparently for the sake of translating them. When an animal like *Tragelaphus euryceros* has no good English name, it is right and proper that its native title—in this case "bongo"—should be employed; but the substitution of "kambi" for antelope is merely confusing. Neither is the work altogether free from absolute errors, while in several instances statements that have been controverted reappear as though they were undoubted facts. As an example of the former class we may refer to the statement on p. 42 that "large flocks of toucans (a bird with a huge bill)" are among the denizens of the Congo forest! As an instance of the second kind, it may be mentioned that (pp. 154-155) the author revives the old story of the gorilla advancing to the attack in the upright posture, beating his breast with his fists. We thought this story had been disposed of by Winwood Reade, who denies that du Chaillu ever saw a living gorilla in the wild state; and, so far as we are aware, no subsequent traveller, with better information at command, has ever said a word in its support.

Again, several of the incidents related appear absolutely incredible. For instance, on p. 95 we have a wonderful picture of a gorilla struggling to free himself from a porcupine on which he had incautiously trodden in his descent from a tree. Bearing in mind the well-known power in wild animals of detecting the presence of other creatures, such an event requires the most convincing testimony to render it credible, and yet it is related without special comment. In another chapter (p. 160) we are told how a python coiled around a tree-trunk "made a tremendous spring" and in an instant was coiled tightly round the body of an unfortunate antelope, which it squeezed to death. How a python could make the spring in question and at the same time disengage itself from the tree around which it was coiled we are not told. As a minor matter, a small inaccuracy in connection with this anecdote may be mentioned. In the accompanying illustration the antelope, which is evidently one of those species of which the females are unarmed, is represented with horns, and yet in the text it is alluded to as a female.

Although it is certainly incorrect to call a land-tortoise a turtle (p. 101), this confusion in terms may perhaps be excused on account of the author's nationality. A similar excuse cannot, however, possibly be made for the statement on p. 266 that "a pack of ugly-looking striped hyænas" advanced into the moonlight. In the first place, striped hyænas are quite unknown in West Africa; and, in the second, the author is refuted by his own draughtsman, who, in the plate on the opposite page, has figured an unmistakable group of *spotted* hyænas. Moreover, if we mistake not, the illustration in question is based, without acknowledgment, on a picture which has already appeared elsewhere.

Neither can we congratulate the author on his views with regard to the *raison d'être* of the coloration of certain animals. It has, for instance, been almost conclusively proved by Mr. Pocock in this Journal (vol. lxii. p. 584) that the striking type of coloration prevalent among the harnessed antelopes is strictly protective. And yet, when referring to the bongo (a member of the group), the author (p. 223) writes as follows:—

> "'My beauty is my curse, dear kambis and ncheris,' replied the bongo; 'my yellow colour and my white stripes are my bane, for my enemies, which are also yours, can spy me further and quicker than they do you.'"

Quite apart from the misapprehension of the object of the bongo's colouring, it may strike the reader of this marvellous book that animals thus endowed with the "knowledge of good and evil," as indicated by their conversation, might have been trusted to have devised some artificial mode of concealing themselves from their enemies! R. L.

OUR BOOK SHELF.

Roads; their Construction and Maintenance. By A. Greenwell, A.M.I.C.E., and J. V. Elsden, F.G.S. Pp. vii + 280. (London: Whittaker and Co., 1901.) Price 5*s*.

THIS is a very practical and useful treatise on roads and their maintenance and may be read with great advantage by any intelligent road surveyor. After the dissolution of the turnpike trusts and the handing over of the roads to the charge of the ordinary highway surveyors the main roads of this country became much neglected. The power acquired by County Councils over the main roads, and of District Councils over other highways, has to a certain extent revolutionised the system of road management and a marked improvement has taken place. The use of the cycle and the motor-car, however, demands a much higher standard of efficiency than was ever before required. There is no doubt that the motor-car, as a means of locomotion and transport, has come to stay and will in future fulfil in many cases functions for which now it is deemed necessary to provide light railways and suburban tramways. For these machines to be used with comfort a clear and even road surface, free from mud and loose stones at all times of the year, is indispensable. The best steam-rolled macadamised roads do not fulfil these conditions. In this respect what are termed tar macadam roads, which have been adopted in a great many suburban districts, not only afford a good surface for traction but, being impervious to wet and not acted upon by frost, are clean and more economical than macadamised roads; they are easily repaired and there is an entire absence of loose stones, equally dangerous for horses and deleterious to rubber tyres. The authors speak favourably of this class of road and describe the system as growing in favour, but the cost as given in

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the book is higher than that at which they can be laid in the neighbourhood of provincial towns.

Nearly half the book is devoted to a description of the materials used in the maintenance of roads and to their petrology, a subject which should be carefully studied by road surveyors. The authors very clearly show that it is more economical to procure suitable material from a distance than to employ local stones because the first cost is less. There is a very considerable difference in the wearing qualities of different kinds of stone, the reasons for which are clearly shown in the book.

The chapter on the construction of roads gives information which is now little required in this country, but would be of service to a surveyor in the colonies; those on maintenance and cost contain a great many useful and practical hints. The observations under the last head are well worth the consideration of all authorities having charge of the roads of this country. The authors emphasise what has often been pointed out—that good roads can only be obtained by their being placed under skilled management and by maintaining a high standard of efficiency; that roads maintained in good condition cost less to keep up than those which are allowed to be rutty, uneven and covered with loose stones and mud; and that while unnecessary expenditure is to be avoided, the community ought to understand that money well spent in skilled labour and good material is often saved over and over again in time and convenience.

Morphology of Spermatophytes. By John M. Coulter, Ph.D., and Charles J. Chamberlain, Ph.D. Pp. x+188. (New York: D. Appleton and Co., 1901.) Price 1·75 dollars.

For a long time past a comprehensive account of the gymnosperms has been greatly needed, for within recent years many important memoirs have appeared which have thrown much light on the structure and relationships of this interesting family of plants. It is, then, with an anticipatory feeling of pleasure that one opens the first instalment of Messrs. Coulter and Chamberlain's book on the morphology of the spermatophytes, seeing that it is entirely devoted to the gymnosperms. And it may at once be said that the authors have done their work well. The book is more than a critical exposition of our present knowledge, for it embodies also the results of a considerable amount of original research on the plants in question. The illustrations are many and good, and include a large proportion of new figures.

The main groups into which the authors divide the family are dealt with in separate chapters, and *Ginkgo* is treated as the representative of a division coordinate with that of the Cycadales or of the Coniferales. The chief fossil types are also considered, and a somewhat detailed and illustrated description is given, based on a study of Dr. Wieland's preparations, of the structure of the strobilus of *Cycadoidea.*

A due proportion is maintained between the space allotted to the account of internal microscopic structure and of general morphology respectively, although naturally the former, which includes the cytological details, comes in for the greater share. Nevertheless, by no means the least interesting chapters in the book are those dealing with the comparative morphology and phylogeny of the gymnosperms as a whole. The authors would regard them as having a monophyletic origin, traceable to a Filicinean ancestry through the Cycadofilices. They base their opinion mainly on the undoubted descent of the cycads from these forms, and on the difficulty of dissociating the other gymnosperms from the cycads. They do not, however, regard the connection between the different groups as a very close one, and suggest that the Bennettitean stock may have served as the starting-point for the cycads, whilst they would refer Ginkgoales and Coniferales to a Cordaitean ancestry.

They judiciously refrain from dealing very specifically with the Gnetales. The three constituent genera, Gnetum, Tumboa (a name which one regrets to see displacing Welwitschia) and Ephedra differ so widely, both from each other as well as from the rest of the main groups, that they can only be regarded as isolated remnants of some ancient line, the affinities of which it is as yet impossible to do more than guess at.

A short sketch of the geographical distribution of the gymnosperms brings the volume to a close. The authors are to be congratulated on the ability they have displayed in producing a work which is valuable, not only as a text-book, but as a real contribution to science.

Guide Pratique pour les Calculs de Résistance des chaudières a vapeur et l'Essai des matériaux employés. Par G. Huin et E. Maire, avec la collaboration de H. Walther Meunier. "Actualitiés Scientifiques." Pp. vi+67. (Paris: Gauthier-Villars, 1901.) Price fr. 2.75.

This book, consisting of a collection of data and tables relating to boiler construction, is a translation of those adopted by l'Union Internationale des Associations de surveillance d'Appareils a Vapeur, which are in common use in Germany.

Part i. is devoted to formulæ, supplemented by extensive tables, for the determination of the dimensions of the principal parts of boilers.

Part ii. gives the rules relating to the selection of the material and specifies the tests to be used in any case.

The whole book covers about the same ground as the Board of Trade or Lloyd's rules for boilers, considered in greater detail and the calculations assisted by tables. The latter include, thickness of flue plates, for various lengths, diameters and pressures, thickness of shell for iron and steel, with various joints, dimensions and pressures, and the thickness of flat plates under various systems of staying.

The formulæ given are in nearly every case of the same form as those used here, but generally speaking the constants are such as to give slightly smaller dimensions.

This is due to the use of an average factor of safety of 4·5 compared with 5 required by the Board of Trade.

For the thickness of flue the formula given is Bach's

$$t=\frac{p.d}{k}\left(1+\sqrt{1+\frac{p}{k'}\,\frac{l}{l+d}}\right)+k'',$$

which should be applicable for a much wider range than our simple

$$t=\sqrt{\frac{p.l.d.}{k}}.$$

There is very little that is not to be found in an ordinary engineer's pocket book. F. H. H.

Ein Wort über den Sitz der vulkanischen Kräfte in der Gegenwart. (*Mittheilung aus dem Museum für Volkerkunde zu Leipzig.*) Von Alphons Stübel. Pp. 15; 9 figures in text, 1 coloured plate. (Leipzig: Max Weg, 1901.)

As such a difficult subject cannot be discussed in a short notice, it must suffice to give the author's conclusions. He regards the globe as originally a liquid mass, which has become incrusted through loss of heat. This crust at first would be thin and incapable of offering an effective resistance to the struggles of the liquid interior. It would be ruptured at countless points, great floods of lava would be outpoured, without, however, the building up of important volcanic hills. At this epoch the earth may have even been surrounded by a photosphere. In the second stage the crust layer thickens to about 10 kilometres—the phenomena are similar in kind, but correspondingly reduced in extent. In the third stage the crust layer is about 25 kilometres, and the places of

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